

Figure 4. Phylogenetic tree for the swifts, adapted from Lee *et al.* (1996) figure 3, a bootstrap consensus tree for 1000 replicates. No time scale. Numbers have same meanings as in Figure 1.

be established. The aim should be full analyses of all taxa with all available techniques.

Summary

A parsimonious phylogenetic tree for the swifts, which is consistent with a hypothetical historical narrative and zoogeographical facts, is presented. The treeswifts are treated as a tribe Hemiprocytini within Apodinae. Inclusion of the genus *Schoutedenapus* in Apodini is suggested. Three trees based on DNA analyses are adapted in order to facilitate direct comparisons. Differences between the four trees are discussed. Further detailed studies of the swifts with different available techniques are needed.

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On types of trochilids in the Natural History Museum, Tring. I. *Amazilia Sumichrasti* Salvin, in relation to morphology and biogeography within the *A. beryllina* complex

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Within the genus *Amazilia*, about 30 species (e.g. Peters 1945: 29, Walters 1980: 33, Sibley & Monroe 1990: 30) and numerous subspecies are recognized. Peters (1945; based on Simon 1921) gives the most complete list comprising 81 taxa and further types of uncertain status, many of which must be judged from an historical point of view. In certain cases only single specimens were available to the describer, and some of these were believed to be aberrant individuals or hybrids. Moreover, taxonomic work on *Amazilia* has been mainly restricted to selected taxa or species groups (subgenera). In view of their heterogeneous treatment in publications before and after Peters' check-list, further examination as presented in this study can throw new light on the validity of critical specimens or taxa. Here, I examine morphological variation within the Berylline Hummingbird, *Amazilia beryllina*, and ascribe *A. sumichrasti* to a distinct subspecies.

Material and methods

Geographic variation in coloration and morphometric data of *Amazilia* specimens in the Natural History Museum, Tring (BMNH) collection

(including types; see Warren 1966) were compared with those of specimens from other museums (see Acknowledgements). The analysis of differences in mensural characters between populations was based on measurements of the bill (proximal end of nasal operculum to tip), wings and tail (rectrices 1, 5). As colours in *Amazilia* species (subfamily: Trochilinae) are mainly iridescent, general descriptions of plumage patterns are subjective and comparisons were made with types or selected individuals. Other colours mentioned in the text refer to Smithe (1975). Subadult birds could be easily recognized mainly by the brownish borders of the body feathers (especially neck, rump), or brownish coloration of the breast and abdominal parts. Measurements of such birds were excluded from the analysis of mensural data.

Information on sex and localities of the specimens were obtained from their labels. However, in some cases the phenotypic characters or measurements indicated that a specimen was wrongly sexed. Collecting sites were located using various maps (scale: 1:4,000,000, 1:1,800,000) and monographs (Friedmann *et al.* 1950, Binford 1989), respectively. In order to obtain reasonable sample sizes, specimens from adjacent localities were grouped in "pools" (method after Vuilleumier 1968).

Results and discussion

Biogeography and morphology within the A. beryllina group

The current distribution of the races of *A. beryllina* centres on the Pacific slopes from Mexico to El Salvador. The species is a relatively common inhabitant of oak-rich woodlands, forest edges and shrub (Howell & Webb 1995). Morphologically, the most obvious geographic variation occurs in the dorsal plumage, including the tail. In the western states from Sonora to Guerrero, *A. b. viola* can be regarded the least contrasted taxon of the group. The plumage is dark golden green, similar to *A. b. beryllina*, but with a rufous lower belly and abdomen. The upperparts have sometimes a certain greyish tinge and show dark violet (172 in Smithe 1975) only in the tail coverts and rectrices. Some intergradation in the ventral coloration towards the nominate form can be observed in Michoacán specimens that possess reduced rufous parts abdominally. *A. b. beryllina* ranges from District Federal eastward to Veracruz (here reaching the Atlantic slope), and southward to northeastern Oaxaca, with an altitudinal distribution between 600 and 3,000 m. Concerning the dorsal coloration, more variation is recognizable in nominate *beryllina* than in *A. b. viola*, with copperish to purplish gloss on the lower back and rump. Besides, the rectrices in *A. b. beryllina* are more contrasting copper to rufous.

Within the southern *beryllina* forms, two striking colour morphs exist in the colour pattern of the tail. *A. b. lichtensteini* shows in both sexes a rather light gloss in the rectrices that can be best described as chrome-coloured (see Moore 1950); partially, the lateral parts are purplish. In contrast to all other races, this taxon inhabits a very limited area in western Chiapas that seems mainly to be restricted to the slopes of Cerro Brujo. *A. b. devillei* is the only member of the

species that occurs outside Mexico, in the highlands of southern Guatemala, El Salvador and central Honduras. It represents the richest coloured race of the *beryllina* group. Remarkably, the dorsal plumage is more golden to bronze-green than in all other forms. In particular, the upper tail-coverts and rectrices vary from copperish to intensive purple red. A common feature shared with *A. b. lichtensteini* is the less extended (visible), paler chestnut coloration at the wing base than in *A. b. beryllina* and *A. b. viola*.

From the arid valley of Rio Motagua, northeastern Guatemala, Carriker & Meyer de Schauensee (1935) described a questionable subspecies, *A. b. motaguae*. No validity was given to this taxon by following reviewers (e.g. Peters 1945, Land 1970). My examination of the type series revealed that the most important distinguishing characters (i.e. brownish tips in rectrices) should be mostly counted on juvenile or female characters. As there exists a relatively high amount of intraracial variation in *A. b. devillei*, the validity of *A. b. motaguae* should be rejected. Additionally, the southernmost Mexican population of *A. beryllina*, ranging from the coastal Atlantic slopes to the central mountainous areas of Chiapas, has been included in *A. b. devillei* (i.e. Friedmann *et al.* 1950, Howell & Webb 1995).

Morphological aspects and type locality of Amazilia Sumichrasti (Salvin 1891)

Holotype: BMNH 1887.3.22.1865, Santa Efigénia, Tehuán-tepec, Oaxaca, Mexico.

In its general appearance, the type resembles a highly coloured individual of the southernmost *beryllina* race *devillei*. Characteristic features are the relatively dark glittering green plumage, especially on the head, and below extending to the abdomen, the chestnut bases of the inner primaries and secondaries as well as the contrasting tail (see Salvin 1891). It is of interest that the colour of the latter shows a certain purplish gloss instead of only "coppery bronze" mentioned in the first description. As found in other members of the genus, the chin and upper throat feathers lack conspicuous white subterminal bars, suggesting the type to be a male.

The type locality is situated in extreme southeastern Oaxaca (Santa Efigénia). Thus, it has been believed by some authors to represent an extreme western example of *A. b. devillei* or an intermediate towards the nominate form (see below), respectively, although the collecting site is in particular close to the range of *A. b. lichtensteini*.

With the single type at hand, it was not possible to detect either significant morphological or morphometric differences in comparison to other *beryllina* races. The later comparison of a series of possible *A. b. devillei* specimens from Chiapas with typical representatives of the race from Guatemala (holdings of MLZ), with regard to the "unique" features of the *Sumichrasti* type, revealed evidence for the subspecific distinctness of the southern Mexican population of *A. beryllina*.

Taxonomic aspects

The taxonomic history of *A. Sumichrasti* is comparable to those of other single specimens once described as new taxa. Salvin & Godman

(1892) and Boucard (1895) regarded it as a valid species, an opinion shared by Ridgway (1911). Salvin (1892) and Hartert (1900) even noted some similarity with *Amazilia Ocai* (Gould 1859), a presumed intrageneric hybrid of *A. beryllina* and *A. cyanocephala* (Berlioz 1932, pers. obs.) from Mexico, although Hartert also mentioned distinguishing features (crown less shining green, throat lacking conspicuous white centre, tail copperish, chestnut-coloured under tail-coverts). Apparently, Simon (1921) ignored the bird, whereas Peters (1945) considered *A. Sumichrasti* to be an aberrant specimen of *A. b. beryllina* or an intermediate between the nominate race and *devillei*. Since then, intergradation between both subspecies has been proposed as the cause for the coloration patterns in southern Mexican birds (Friedmann *et al.* 1950), regarding the coastal strip of southeastern Oaxaca and Chiapas as a hybridization zone (Moore 1950).

In the latest review on the birds of Oaxaca (Binford 1989), there is no indication of the existence of another subspecies within the *beryllina* complex although the *sumichrasti* type is mentioned (regarded as an intermediate of nominate *beryllina* and *devillei*, too). Against this background, it is not surprising that Sibley & Monroe (1990) cite *A. Sumichrasti* in synonymy with *A. b. devillei*. At least, Howell & Webb (1995) treat the southern forms as a peculiar morphological group, being aware of the taxonomic uncertainties. As mentioned above, the comparison of the type with specimens from other parts of southern Mexico including the races *devillei* and *lichtensteini* strongly supports the view that the *beryllina* population of coastal and interior Chiapas can be separated as a distinct taxon, *Amazilia beryllina sumichrasti*.

Diagnosis

Generally, more grass-green and less shining golden-green than *A. beryllina devillei* and *A. b. lichtensteini*, in this character resembling the northwestern form *viola*, but underparts entirely green as in the former ones. Crown relatively dull. Similar to *A. b. devillei* in the coloration on the base of the inner primaries and secondaries (132A, Brick Red; lacking in female), not as prominent as in the nominate form. Rump nearly without the purplish gloss of *A. b. devillei*. No differences exist in the upper tail-coverts in both sexes and the rectrices in males. Adult females and immatures in general with metallic chrome median rectrices as in *A. b. lichtensteini* (but often with purplish traces); outer rectrices more dark chestnut (32) to purplish. Concerning other features, sexual dimorphism is restricted to the whitish subterminal bars of the throat feathers which are more marked in females.

In size, *A. b. sumichrasti* is similar to *devillei* and *lichtensteini*, although the wings are slightly longer than in the latter form (Table 1). The duller green plumage is typical of the northern distributed subspecies that occur along the Pacific coast (*A. b. viola*) or the central and northeastern parts of Mexico, respectively (*A. b. beryllina*).

Range

A. b. sumichrasti is found in the coastal parts up to the mountains of extreme southeastern Oaxaca, southern and north-central Chiapas

TABLE 1

Ranges, means and standard deviations in morphometric characters of *Amazilia beryllina* subspecies. For geographical reasons, only data of *beryllina devillei* specimens from Guatemala are tabled

	Bill (mm)	Wing (mm)	Rectrix 1 (mm)	Rectrix 5 (mm)
<i>A. b. devillei</i>				
Male: n=15	18.5–21.5 20.3 ± 0.71	52.5–56.5 54.4 ± 1.19	25.0–28.5 27.3 ± 0.99	30.0–34.0 31.7 ± 1.26
Female: n=23	19.5–21.5 20.7 ± 0.71	51.0–53.0 51.8 ± 0.75	25.5–28.5 26.9 ± 0.97	28.5–32.0 30.4 ± 1.19
<i>A. b. lichtensteini</i>				
Male: n=24	19.0–21.0 19.8 ± 0.60	49.0–55.0 53.5 ± 1.65	25.0–28.5 26.9 ± 0.99	30.0–34.0 31.6 ± 0.99
Female: n=18	19.0–22.5 20.7 ± 0.89	50.0–53.5 52.1 ± 1.06	25.5–28.5 27.1 ± 0.72	28.0–32.5 30.2 ± 1.03
<i>A. b. sumichrasti</i>				
Male: n=24	19.0–22.5 20.5 ± 0.83	53.5–56.5 55.2 ± 0.77	25.5–28.5 27.2 ± 0.79	31.5–34.0 32.6 ± 0.66
Female: n=14	20.0–22.0 21.2 ± 0.64	49.5–54.5 52.8 ± 1.14	26.0–28.5 27.5 ± 0.82	29.0–32.5 30.5 ± 1.08

(Fig. 1), but not known from Guatemala. Northward, it inhabits an area as far as Rancho Santa Efigénia (type locality; c. 250 m, 16°27'N, 94°14'W) and the Tapanatepec region, but possibly does not range into the adjacent mountains of northern Oaxaca where there is one record of a female identified by A. Weller as *A. b. lichtensteini* (USNM, no. 467908, La Cova). Residential status of *A. b. sumichrasti* can be assumed for the Sierra Madre de Chiapas and probably the Montañas del Norte de Chiapas where it reaches an altitude of at least 1,700 m (Yerba Buena, 17°06'N, 92°53'W). So far, the northwest border of the range remains unclear, as the nominate form has been believed to inhabit the parts of eastern Oaxaca that seem to be at least partially unexplored (Binford 1989, p. 147). In northwestern Chiapas, it is replaced in mountainous areas by *lichtensteini*, the last recognized taxon in the *beryllina* group (Moore 1950). Apart from the type locality (Cerro Brujo, Ocozocuaula), *lichtensteini* has been believed to range also in the central mountains of Chiapas (Friedmann *et al.* 1950), but records of *A. beryllina* from this region (listed by the data bank of ECOSUR, San Cristóbal de las Casas) probably refer to *A. b. sumichrasti*.

Conclusions

Presumably, the current population of *A. b. sumichrasti* once connected the *beryllina* populations from northwestern Mexico to Guatemala. For example, clinal variation can be recognized in the upper tail-coverts which are reddish purple in *A. b. devillei* and *A. b. sumichrasti*, but dark purple in the race *viola*. Based on morphological characters, the new taxon is closely allied to *A. b. devillei* and, with the

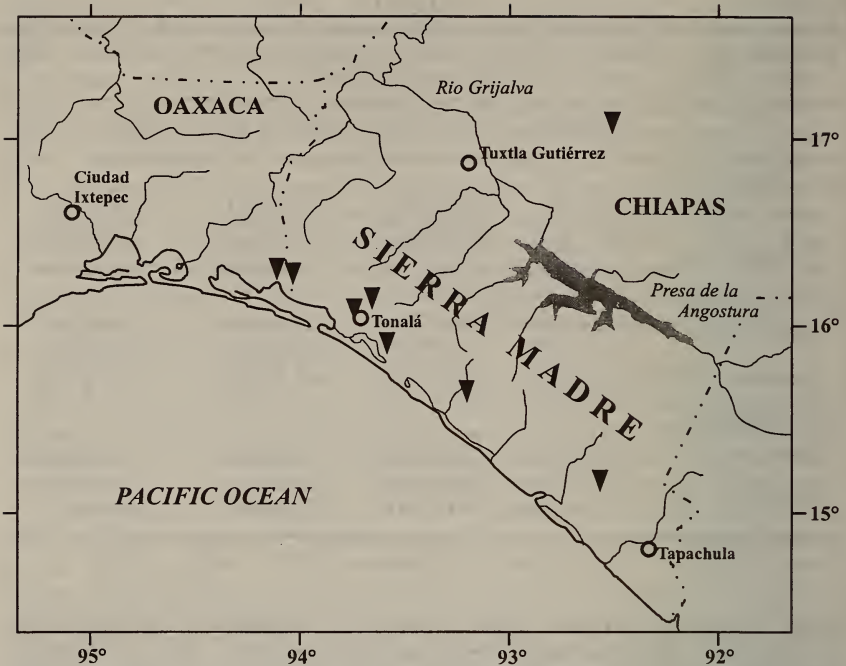


Figure 1. Collecting sites (filled triangles) of *Amazilia beryllina sumichrasti* in Oaxaca and Chiapas, southern Mexico.

difference of the duller plumage and sexual dimorphism in the tail coloration, to *A. b. lichtensteini*. Intergradation of *A. b. devillei* with the nominate form as supposed by Friedmann *et al.* (1950) and Binford (1989) can be excluded not only for reasons of coloration but also of distribution, because there is possibly a separation from the most northwestern population of the race *lichtensteini* in Oaxaca. Additional distributional data on these subspecies are necessary to determine their range boundaries. I presume that *A. b. sumichrasti* is restricted to the southwestern slopes of the Sierra Madre and the Montañas del Norte (as indicated by the MLZ series from Yerba Buena, and adjacent *beryllina* localities in the ECOSUR data bank). With the fragmentary data at hand, it is problematic to estimate if the *sumichrasti* populations are connected or separated by the valley of the Rio Grijalva/Presa de la Angostura in interior Chiapas (Fig. 1), where original woodlands have been widely cleared (Howell & Webb 1995).

Altogether, the appearance of morphological characters in the southern *beryllina* subspecies indicates microevolutionary processes as a result of isolation of preliminary taxa groups. As has been suggested for numerous Central American taxa, including *Amazilia* species (Howell 1993), climatic changes in glacial and interglacial periods which caused,